



SEQUENCE LISTING

<110> Simard, John
Simms, John J.
Qiu, Zhiyong

<120> Immunogenic Compositions Derived from Poxviruses and Methods of Using Same

<130> 51300-00006

<140> 10/620,787

<141> 2003-07-15

<150> 60/396,293

<151> 2002-07-15

<160> 32

<170> PatentIn version 3.2

<210> 1

<211> 250

<212> PRT

<213> Vaccinia virus

<400> 1

Met Gly Ala Ala Ala Ser Ile Gln Thr Thr Val Asn Thr Leu Ser Glu
1 5 10 15

Arg Ile Ser Ser Lys Leu Glu Gln Glu Ala Asn Ala Ser Ala Gln Thr
20 25 30

Lys Cys Asp Ile Glu Ile Gly Asn Phe Tyr Ile Arg Gln Asn His Gly
35 40 45

Cys Asn Leu Thr Val Lys Asn Met Cys Ser Ala Asp Ala Asp Ala Gln
50 55 60

Leu Asp Ala Val Leu Ser Ala Ala Thr Glu Thr Tyr Ser Gly Leu Thr
65 70 75 80

Pro Glu Gln Lys Ala Tyr Val Pro Ala Met Phe Thr Ala Ala Leu Asn
85 90 95

Ile Gln Thr Ser Val Asn Thr Val Val Arg Asp Phe Glu Asn Tyr Val
100 105 110

Lys Gln Thr Cys Asn Ser Ser Ala Val Val Asp Asn Lys Leu Lys Ile
115 120 125

Gln Asn Val Ile Ile Asp Glu Cys Tyr Gly Ala Pro Gly Ser Pro Thr
130 135 140

Asn Leu Glu Phe Ile Asn Thr Gly Ser Ser Lys Gly Asn Cys Ala Ile
145 150 155 160

Lys Ala Leu Met Gln Leu Thr Thr Lys Ala Thr Thr Gln Ile Ala Pro
165 170 175

Lys Gln Val Ala Gly Thr Gly Val Gln Phe Tyr Met Ile Val Ile Gly
180 185 190

Val Ile Ile Leu Ala Ala Leu Phe Met Tyr Tyr Ala Lys Arg Met Leu
195 200 205

Phe Thr Ser Thr Asn Asp Lys Ile Lys Leu Ile Leu Ala Asn Lys Glu
210 215 220

Asn Val His Trp Thr Thr Tyr Met Asp Thr Phe Phe Arg Thr Ser Pro
225 230 235 240

Met Val Ile Ala Thr Thr Asp Met Gln Asn
245 250

<210> 2
<211> 250
<212> PRT
<213> Vaccinia virus

<400> 2

Met Gly Ala Ala Ala Ser Ile Gln Thr Thr Val Asn Thr Leu Ser Glu
1 5 10 15

Arg Ile Ser Ser Lys Leu Glu Gln Glu Ala Asn Ala Ser Ala Gln Thr
20 25 30

Lys Cys Asp Ile Glu Ile Gly Asn Phe Tyr Ile Arg Gln Asn His Gly
35 40 45

Cys Asn Leu Thr Val Lys Asn Met Cys Ser Ala Asp Ala Asp Ala Gln
50 55 60

Leu Asp Ala Val Leu Ser Ala Ala Thr Glu Thr Tyr Ser Gly Leu Thr
65 70 75 80

Pro Glu Gln Lys Ala Tyr Val Pro Ala Met Phe Thr Ala Ala Leu Asn
85 90 95

Ile Gln Thr Ser Val Asn Thr Val Val Arg Asp Phe Glu Asn Tyr Val
100 105 110

Lys Gln Thr Cys Asn Ser Ser Ala Val Val Asp Asn Lys Leu Lys Ile
Page 2

115 120 125
 Gln Asn Val Ile Ile Asp Glu Cys Tyr Gly Ala Pro Gly Ser Pro Thr
 130 135 140
 Asn Leu Glu Phe Ile Asn Thr Gly Ser Ser Lys Gly Asn Cys Ala Ile
 145 150 155 160
 Lys Ala Leu Met Gln Leu Thr Thr Lys Ala Thr Thr Gln Ile Ala Pro
 165 170 175
 Arg Gln Val Ala Gly Thr Gly Val Gln Phe Tyr Met Ile Val Ile Gly
 180 185 190
 Val Ile Ile Leu Ala Ala Leu Phe Met Tyr Tyr Ala Lys Arg Met Leu
 195 200 205
 Phe Thr Ser Thr Asn Asp Lys Ile Lys Leu Ile Leu Ala Asn Lys Glu
 210 215 220
 Asn Val His Trp Thr Thr Tyr Met Asp Thr Phe Phe Arg Thr Ser Pro
 225 230 235 240
 Met Val Ile Ala Thr Thr Asp Met Gln Asn
 245 250

<210> 3
 <211> 250
 <212> PRT
 <213> Variola virus

<400> 3

Met Gly Ala Ala Ala Ser Ile Gln Thr Thr Val Asn Thr Leu Ser Glu
 1 5 10 15
 Arg Ile Ser Ser Lys Leu Glu Gln Glu Ala Asn Ala Ser Ala Gln Thr
 20 25 30
 Lys Cys Asp Ile Glu Ile Gly Asn Phe Tyr Ile Arg Gln Asn His Gly
 35 40 45
 Cys Asn Leu Thr Val Lys Asn Met Cys Ser Ala Asp Ala Asp Ala Gln
 50 55 60
 Leu Asp Ala Val Leu Ser Ala Ala Thr Glu Thr Tyr Ser Gly Leu Thr
 65 70 75 80
 Pro Glu Gln Lys Ala Tyr Val Pro Ala Met Phe Thr Ala Ala Leu Asn
 85 90 95

Ile Gln Thr Ser Val Asn Thr Val Val Arg Asp Phe Glu Asn Tyr Val
100 105 110

Lys Gln Thr Cys Asn Ser Ser Ala Val Val Asp Asn Lys Leu Lys Ile
115 120 125

Gln Asn Val Ile Ile Asp Glu Cys Tyr Gly Ala Pro Gly Ser Pro Thr
130 135 140

Asn Leu Glu Phe Ile Asn Thr Gly Ser Ser Lys Gly Asn Cys Ala Ile
145 150 155 160

Lys Ala Leu Met Gln Leu Thr Thr Lys Ala Thr Thr Gln Ile Ala Pro
165 170 175

Arg Gln Val Ala Gly Thr Gly Val Gln Phe Tyr Met Ile Val Ile Gly
180 185 190

Val Ile Ile Leu Ala Ala Leu Phe Met Tyr Tyr Ala Lys Arg Met Leu
195 200 205

Phe Thr Ser Thr Asn Asp Lys Ile Lys Leu Ile Leu Ala Asn Lys Glu
210 215 220

Asn Val His Trp Thr Thr Tyr Met Asp Thr Phe Phe Arg Thr Ser Pro
225 230 235 240

Met Val Ile Ala Thr Thr Asp Ile Gln Asn
245 250

<210> 4
<211> 250
<212> PRT
<213> Variola virus

<400> 4

Met Gly Ala Ala Ala Ser Ile Gln Thr Thr Val Asn Thr Leu Ser Glu
1 5 10 15

Arg Ile Ser Ser Lys Leu Glu Gln Glu Ala Asn Ala Ser Ala Gln Thr
20 25 30

Lys Cys Asp Ile Glu Ile Gly Asn Phe Tyr Ile Arg Gln Asn His Gly
35 40 45

Cys Asn Leu Thr Val Lys Asn Met Cys Ser Ala Asp Ala Asp Ala Gln
50 55 60

Leu Asp Ala Val Leu Ser Ala Ala Thr Glu Thr Tyr Ser Gly Leu Thr
65 70 75 80

Pro Glu Gln Lys Ala Tyr Val Pro Ala Met Phe Thr Ala Ala Leu Asn
85 90 95

Ile Gln Thr Ser Val Asn Thr Val Val Arg Asp Phe Glu Asn Tyr Val
100 105 110

Lys Gln Thr Cys Asn Ser Ser Ala Val Val Asp Asn Lys Leu Lys Ile
115 120 125

Gln Asn Val Ile Ile Asp Glu Cys Tyr Gly Ala Pro Gly Ser Pro Thr
130 135 140

Asn Leu Glu Phe Ile Asn Thr Gly Ser Ser Lys Gly Asn Cys Ala Ile
145 150 155 160

Lys Ala Leu Met Gln Leu Thr Thr Lys Ala Thr Thr Gln Ile Ala Pro
165 170 175

Arg Gln Val Ala Gly Thr Gly Val Gln Phe Tyr Met Ile Val Ile Gly
180 185 190

Val Ile Ile Leu Ala Ala Leu Phe Met Tyr Tyr Ala Lys Arg Met Leu
195 200 205

Phe Thr Ser Thr Asn Asp Lys Ile Lys Leu Ile Leu Ala Asn Lys Glu
210 215 220

Asn Val His Trp Thr Thr Tyr Met Asp Thr Phe Phe Arg Thr Ser Pro
225 230 235 240

Met Val Ile Ala Thr Thr Asp Ile Gln Asn
245 250

<210> 5
<211> 250
<212> PRT
<213> Artificial

<220>
<223> Consensus sequence for SEQ ID NOS. 1-4

<400> 5

Met Gly Ala Ala Ala Ser Ile Gln Thr Thr Val Asn Thr Leu Ser Glu
1 5 10 15

Arg Ile Ser Ser Lys Leu Glu Gln Glu Ala Asn Ala Ser Ala Gln Thr
Page 5

20 25 30
 Lys Cys Asp Ile Glu Ile Gly Asn Phe Tyr Ile Arg Gln Asn His Gly
 35 40 45
 Cys Asn Leu Thr Val Lys Asn Met Cys Ser Ala Asp Ala Asp Ala Gln
 50 55 60
 Leu Asp Ala Val Leu Ser Ala Ala Thr Glu Thr Tyr Ser Gly Leu Thr
 65 70 75 80
 Pro Glu Gln Lys Ala Tyr Val Pro Ala Met Phe Thr Ala Ala Leu Asn
 85 90 95
 Ile Gln Thr Ser Val Asn Thr Val Val Arg Asp Phe Glu Asn Tyr Val
 100 105 110
 Lys Gln Thr Cys Asn Ser Ser Ala Val Val Asp Asn Lys Leu Lys Ile
 115 120 125
 Gln Asn Val Ile Ile Asp Glu Cys Tyr Gly Ala Pro Gly Ser Pro Thr
 130 135 140
 Asn Leu Glu Phe Ile Asn Thr Gly Ser Ser Lys Gly Asn Cys Ala Ile
 145 150 155 160
 Lys Ala Leu Met Gln Leu Thr Thr Lys Ala Thr Thr Gln Ile Ala Pro
 165 170 175
 Arg Gln Val Ala Gly Thr Gly Val Gln Phe Tyr Met Ile Val Ile Gly
 180 185 190
 Val Ile Ile Leu Ala Ala Leu Phe Met Tyr Tyr Ala Lys Arg Met Leu
 195 200 205
 Phe Thr Ser Thr Asn Asp Lys Ile Lys Leu Ile Leu Ala Asn Lys Glu
 210 215 220
 Asn Val His Trp Thr Thr Tyr Met Asp Thr Phe Phe Arg Thr Ser Pro
 225 230 235 240
 Met Val Ile Ala Thr Thr Asp Met Gln Asn
 245 250

<210> 6
 <211> 110
 <212> PRT
 <213> Vaccinia virus

<400> 6

Met Asp Gly Thr Leu Phe Pro Gly Asp Asp Asp Leu Ala Ile Pro Ala
1 5 10 15

Thr Glu Phe Phe Ser Thr Lys Ala Ala Lys Lys Pro Asp Arg Lys Arg
20 25 30

Glu Gln Ile Val Lys Ala Asp Glu Asp Asp Asn Glu Glu Thr Leu Lys
35 40 45

Gln Arg Leu Thr Asn Leu Glu Lys Lys Ile Thr Asn Val Thr Thr Lys
50 55 60

Phe Glu Gln Ile Glu Lys Cys Cys Lys Arg Asn Asp Glu Val Leu Phe
65 70 75 80

Arg Leu Glu Asn His Ala Glu Thr Leu Arg Ala Ala Met Ile Ser Leu
85 90 95

Ala Lys Lys Ile Asp Val Gln Thr Gly Arg Arg Pro Tyr Glu
100 105 110

<210> 7

<211> 110

<212> PRT

<213> Vaccinia virus

<400> 7

Met Asp Gly Thr Leu Phe Pro Gly Asp Asp Asp Leu Ala Ile Pro Ala
1 5 10 15

Thr Glu Phe Phe Ser Thr Lys Ala Asp Lys Lys Pro Glu Ala Lys Arg
20 25 30

Glu Ala Ile Val Lys Ala Asp Glu Asp Asp Asn Glu Glu Thr Leu Lys
35 40 45

Gln Arg Leu Thr Asn Leu Glu Lys Lys Ile Thr Asn Val Thr Thr Lys
50 55 60

Phe Glu Gln Ile Glu Lys Cys Cys Lys Arg Asn Asp Glu Val Leu Phe
65 70 75 80

Arg Leu Glu Asn His Ala Glu Thr Leu Arg Ala Ala Met Ile Ser Leu
85 90 95

Ala Lys Lys Ile Asp Val Gln Thr Gly Arg Arg Pro Tyr Glu
100 105 110

<210> 8
<211> 110
<212> PRT
<213> Variola virus

<400> 8

Met Asp Gly Thr Leu Phe Pro Gly Asp Asp Asp Leu Ala Ile Pro Ala
1 5 10 15

Thr Glu Phe Phe Ser Thr Lys Ala Ala Lys Lys Pro Glu Ala Lys Arg
20 25 30

Glu Ala Ile Val Lys Ala Asp Gly Asp Asp Asn Glu Glu Thr Leu Lys
35 40 45

Gln Arg Leu Thr Asn Leu Glu Lys Lys Ile Thr Asn Val Thr Thr Lys
50 55 60

Phe Glu Gln Ile Glu Lys Cys Cys Lys Arg Asn Asp Asp Val Leu Phe
65 70 75 80

Arg Leu Glu Asn His Ala Glu Thr Leu Arg Ala Ala Met Ile Ser Leu
85 90 95

Ala Lys Lys Ile Asp Val Gln Thr Gly Arg Arg Pro Tyr Glu
100 105 110

<210> 9
<211> 110
<212> PRT
<213> Variola virus

<400> 9

Met Asp Gly Thr Leu Phe Pro Gly Asp Asp Asp Leu Ala Ile Pro Ala
1 5 10 15

Thr Glu Phe Phe Ser Thr Lys Ala Ala Lys Lys Pro Glu Ala Lys Arg
20 25 30

Glu Ala Ile Val Lys Ala Asp Gly Asp Asp Asn Glu Glu Thr Leu Lys
35 40 45

Gln Arg Leu Thr Asn Leu Glu Lys Lys Ile Thr Asn Val Thr Thr Lys
50 55 60

Phe Glu Gln Ile Glu Lys Cys Cys Lys Arg Asn Asp Asp Val Leu Phe
65 70 75 80

Arg Leu Glu Asn His Ala Glu Thr Leu Arg Ala Ala Met Ile Ser Leu
Page 8

85

90

95

Ala Lys Lys Ile Asp Val Gln Thr Gly Arg Arg Pro Tyr Glu
 100 105 110

<210> 10
 <211> 110
 <212> PRT
 <213> Artificial

<220>
 <223> Consensus sequence for SEQ ID NOs. 6-9

<400> 10

Met Asp Gly Thr Leu Phe Pro Gly Asp Asp Asp Leu Ala Ile Pro Ala
 1 5 10 15

Thr Glu Phe Phe Ser Thr Lys Ala Ala Lys Lys Pro Glu Ala Lys Arg
 20 25 30

Glu Ala Ile Val Lys Ala Asp Gly Asp Asp Asn Glu Glu Thr Leu Lys
 35 40 45

Gln Arg Leu Thr Asn Leu Glu Lys Lys Ile Thr Asn Val Thr Thr Lys
 50 55 60

Phe Glu Gln Ile Glu Lys Cys Cys Lys Arg Asn Asp Asp Val Leu Phe
 65 70 75 80

Arg Leu Glu Asn His Ala Glu Thr Leu Arg Ala Ala Met Ile Ser Leu
 85 90 95

Ala Lys Lys Ile Asp Val Gln Thr Gly Arg Arg Pro Tyr Glu
 100 105 110

<210> 11
 <211> 185
 <212> PRT
 <213> Vaccinia virus

<400> 11

Met Met Thr Pro Glu Asn Asp Glu Glu Gln Thr Ser Val Phe Ser Ala
 1 5 10 15

Thr Val Tyr Gly Asp Lys Ile Gln Gly Lys Asn Lys Arg Lys Arg Val
 20 25 30

Ile Gly Leu Cys Ile Arg Ile Ser Met Val Ile Ser Leu Leu Ser Met
 35 40 45

Ile Thr Met Ser Ala Phe Leu Ile Val Arg Leu Asn Gln Cys Met Ser
50 55 60

Ala Asn Glu Ala Ala Ile Thr Asp Ala Ala Val Ala Val Ala Ala Ala
65 70 75 80

Ser Ser Thr His Arg Lys Val Ala Ser Ser Thr Thr Gln Tyr Asp His
85 90 95

Lys Glu Ser Cys Asn Gly Leu Tyr Tyr Gln Gly Ser Cys Tyr Ile Leu
100 105 110

His Ser Asp Tyr Gln Leu Phe Ser Asp Ala Lys Ala Asn Cys Thr Ala
115 120 125

Glu Ser Ser Thr Leu Pro Asn Lys Ser Asp Val Leu Ile Thr Trp Leu
130 135 140

Ile Asp Tyr Val Glu Asp Thr Trp Gly Ser Asp Gly Asn Pro Ile Thr
145 150 155 160

Lys Thr Thr Ser Asp Tyr Gln Asp Ser Asp Val Ser Gln Glu Val Arg
165 170 175

Lys Tyr Phe Cys Val Lys Thr Met Asn
180 185

<210> 12
<211> 185
<212> PRT
<213> Vaccinia virus

<400> 12

Met Met Thr Pro Glu Asn Asp Glu Glu Gln Thr Ser Val Phe Ser Ala
1 5 10 15

Thr Val Tyr Gly Asp Lys Ile Gln Gly Lys Asn Lys Arg Lys Arg Val
20 25 30

Ile Gly Leu Cys Ile Arg Ile Ser Met Val Ile Ser Leu Leu Ser Met
35 40 45

Ile Thr Met Ser Ala Phe Leu Ile Val Arg Leu Asn Gln Cys Met Ser
50 55 60

Ala Asn Glu Ala Ala Ile Thr Asp Ala Ala Val Ala Val Ala Ala Ala
65 70 75 80

Ser Ser Thr His Arg Lys Val Ala Ser Ser Thr Thr Gln Tyr Asp His
Page 10

85

90

95

Lys Glu Ser Cys Asn Gly Leu Tyr Tyr Gln Gly Ser Cys Tyr Ile Leu
 100 105 110

His Ser Asp Tyr Gln Leu Phe Ser Asp Ala Lys Ala Asn Cys Thr Ala
 115 120 125

Glu Ser Ser Thr Leu Pro Asn Lys Ser Asp Val Leu Ile Thr Trp Leu
 130 135 140

Ile Asp Tyr Val Glu Asp Thr Trp Gly Ser Asp Gly Asn Pro Ile Thr
 145 150 155 160

Lys Thr Thr Ser Asp Tyr Gln Asp Ser Asp Val Ser Gln Glu Val Arg
 165 170 175

Lys Tyr Phe Cys Val Lys Thr Met Asn
 180 185

<210> 13
 <211> 184
 <212> PRT
 <213> Variola virus

<400> 13

Met Met Thr Pro Glu Asn Asp Glu Glu Gln Thr Ser Val Phe Ser Ala
 1 5 10 15

Thr Val Tyr Gly Asp Lys Ile Gln Gly Lys Asn Lys Arg Lys Arg Val
 20 25 30

Ile Gly Ile Cys Ile Arg Ile Ser Met Val Ile Ser Leu Leu Ser Met
 35 40 45

Ile Thr Met Ser Ala Phe Leu Ile Val Arg Leu Asn Gln Cys Met Ser
 50 55 60

Ala Asn Glu Ala Ala Ile Thr Asp Ala Thr Ala Val Ala Ala Ala Leu
 65 70 75 80

Ser Thr His Arg Lys Val Ala Ser Ser Thr Thr Gln Tyr Lys His Gln
 85 90 95

Glu Ser Cys Asn Gly Leu Tyr Tyr Gln Gly Ser Cys Tyr Ile Phe His
 100 105 110

Ser Asp Tyr Gln Leu Phe Ser Asp Ala Lys Ala Asn Cys Ala Thr Glu
 115 120 125

Ser Ser Thr Leu Pro Asn Lys Ser Asp Val Leu Thr Thr Trp Leu Ile
130 135 140

Asp Tyr Val Glu Asp Thr Trp Gly Ser Asp Gly Asn Pro Ile Thr Lys
145 150 155 160

Thr Thr Thr Asp Tyr Gln Asp Ser Asp Val Ser Gln Glu Val Arg Lys
165 170 175

Tyr Phe Cys Val Lys Thr Met Asn
180

<210> 14
<211> 184
<212> PRT
<213> Variola virus

<400> 14

Met Met Thr Pro Glu Asn Asp Glu Glu Gln Thr Ser Val Phe Ser Ala
1 5 10 15

Thr Val Tyr Gly Asp Lys Ile Gln Gly Lys Asn Lys Arg Lys Arg Val
20 25 30

Ile Gly Ile Cys Ile Arg Ile Ser Met Val Ile Ser Leu Leu Ser Met
35 40 45

Ile Thr Met Ser Ala Phe Leu Ile Val Arg Leu Asn Gln Cys Met Ser
50 55 60

Ala Asn Glu Ala Ala Ile Thr Asp Ala Thr Ala Val Ala Ala Ala Leu
65 70 75 80

Ser Thr His Arg Lys Val Ala Ser Ser Thr Thr Gln Tyr Lys His Gln
85 90 95

Glu Ser Cys Asn Gly Leu Tyr Tyr Gln Gly Ser Cys Tyr Ile Phe His
100 105 110

Ser Asp Tyr Gln Leu Phe Ser Asp Ala Lys Ala Asn Cys Ala Thr Glu
115 120 125

Ser Ser Thr Leu Pro Asn Lys Ser Asp Val Leu Thr Thr Trp Leu Ile
130 135 140

Asp Tyr Val Glu Asp Thr Trp Gly Ser Asp Gly Asn Pro Ile Thr Lys
145 150 155 160

Thr Thr Thr Asp Tyr Gln Asp Ser Asp Val Ser Gln Glu Val Arg Lys
165 170 175

Tyr Phe Cys Val Lys Thr Met Asn
180

<210> 15
<211> 185
<212> PRT
<213> Artificial

<220>
<223> Consensus sequence for SEQ ID NOS. 11-14.

<400> 15

Met Met Thr Pro Glu Asn Asp Glu Glu Gln Thr Ser Val Phe Ser Ala
1 5 10 15

Thr Val Tyr Gly Asp Lys Ile Gln Gly Lys Asn Lys Arg Lys Arg Val
20 25 30

Ile Gly Ile Cys Ile Arg Ile Ser Met Val Ile Ser Leu Leu Ser Met
35 40 45

Ile Thr Met Ser Ala Phe Leu Ile Val Arg Leu Asn Gln Cys Met Ser
50 55 60

Ala Asn Glu Ala Ala Ile Thr Asp Ala Ala Val Ala Val Ala Ala Ala
65 70 75 80

Ser Ser Thr His Arg Lys Val Ala Ser Ser Thr Thr Gln Tyr Lys His
85 90 95

Gln Glu Ser Cys Asn Gly Leu Tyr Tyr Gln Gly Ser Cys Tyr Ile Leu
100 105 110

His Ser Asp Tyr Gln Leu Phe Ser Asp Ala Lys Ala Asn Cys Thr Ala
115 120 125

Glu Ser Ser Thr Leu Pro Asn Lys Ser Asp Val Leu Thr Thr Trp Leu
130 135 140

Ile Asp Tyr Val Glu Asp Thr Trp Gly Ser Asp Gly Asn Pro Ile Thr
145 150 155 160

Lys Thr Thr Ser Asp Tyr Gln Asp Ser Asp Val Ser Gln Glu Val Arg
165 170 175

Lys Tyr Phe Cys Val Lys Thr Met Asn

180

185

<210> 16
 <211> 304
 <212> PRT
 <213> Vaccinia virus

<400> 16

Met Pro Gln Gln Leu Ser Pro Ile Asn Ile Glu Thr Lys Lys Ala Ile
 1 5 10 15

Ser Asn Ala Arg Leu Lys Pro Leu Asp Ile His Tyr Asn Glu Ser Lys
 20 25 30

Pro Thr Thr Ile Gln Asn Thr Gly Lys Leu Val Arg Ile Asn Phe Lys
 35 40 45

Gly Gly Tyr Ile Ser Gly Gly Phe Leu Pro Asn Glu Tyr Val Leu Ser
 50 55 60

Ser Leu His Ile Tyr Trp Gly Lys Glu Asp Asp Tyr Gly Ser Asn His
 65 70 75 80

Leu Ile Asp Val Tyr Lys Tyr Ser Gly Glu Ile Asn Leu Val His Trp
 85 90 95

Asn Lys Lys Lys Tyr Ser Ser Tyr Glu Glu Ala Lys Lys His Asp Asp
 100 105 110

Gly Leu Ile Ile Ile Ser Ile Phe Leu Gln Val Leu Asp His Lys Asn
 115 120 125

Val Tyr Phe Gln Lys Ile Val Asn Gln Leu Asp Ser Ile Arg Ser Ala
 130 135 140

Asn Thr Ser Ala Pro Phe Asp Ser Val Phe Tyr Leu Asp Asn Leu Leu
 145 150 155 160

Pro Ser Lys Leu Asp Tyr Phe Thr Tyr Leu Gly Thr Thr Ile Asn His
 165 170 175

Ser Ala Asp Ala Val Trp Ile Ile Phe Pro Thr Pro Ile Asn Ile His
 180 185 190

Ser Asp Gln Leu Ser Lys Phe Arg Thr Leu Leu Ser Ser Ser Asn His
 195 200 205

Asp Gly Lys Pro His Tyr Ile Thr Glu Asn Tyr Arg Asn Pro Tyr Lys
 210 215 220

Leu Asn Asp Asp Thr Gln Val Tyr Tyr Ser Gly Glu Ile Ile Arg Ala
225 230 235 240

Ala Thr Thr Ser Pro Ala Arg Glu Asn Tyr Phe Met Arg Trp Leu Ser
245 250 255

Asp Leu Arg Glu Thr Cys Phe Ser Tyr Tyr Gln Lys Tyr Ile Glu Glu
260 265 270

Asn Lys Thr Phe Ala Ile Ile Ala Ile Val Phe Val Phe Ile Leu Thr
275 280 285

Ala Ile Leu Phe Phe Met Ser Arg Arg Tyr Ser Arg Glu Lys Gln Asn
290 295 300

<210> 17
<211> 304
<212> PRT
<213> Vaccinia virus

<400> 17

Met Pro Gln Gln Leu Ser Pro Ile Asn Ile Glu Thr Lys Lys Ala Ile
1 5 10 15

Ser Asn Ala Arg Leu Lys Pro Leu Asp Ile His Tyr Asn Glu Ser Lys
20 25 30

Pro Thr Thr Ile Gln Asn Thr Gly Lys Leu Val Arg Ile Asn Phe Lys
35 40 45

Gly Gly Tyr Ile Ser Gly Gly Phe Leu Pro Asn Glu Tyr Val Leu Ser
50 55 60

Ser Leu His Ile Tyr Trp Gly Lys Glu Asp Asp Tyr Gly Ser Asn His
65 70 75 80

Leu Ile Asp Val Tyr Lys Tyr Ser Gly Glu Ile Asn Leu Val His Trp
85 90 95

Asn Lys Lys Lys Tyr Ser Ser Tyr Glu Glu Ala Lys Lys His Asp Asp
100 105 110

Gly Leu Ile Ile Ile Ser Ile Phe Leu Gln Val Ser Asp His Lys Asn
115 120 125

Val Tyr Phe Gln Lys Ile Val Asn Gln Leu Asp Ser Ile Arg Ser Ala
130 135 140

Asn Thr Ser Ala Pro Phe Asp Ser Val Phe Tyr Leu Asp Asn Leu Leu
145 150 155 160

Pro Ser Thr Leu Asp Tyr Phe Thr Tyr Leu Gly Thr Thr Ile Asn His
165 170 175

Ser Ala Asp Ala Val Trp Ile Ile Phe Pro Thr Pro Ile Asn Ile His
180 185 190

Ser Asp Gln Leu Ser Lys Phe Arg Thr Leu Leu Ser Ser Ser Asn His
195 200 205

Asp Gly Lys Pro Tyr Tyr Ile Thr Glu Asn Tyr Arg Asn Pro Tyr Lys
210 215 220

Leu Asn Asp Asp Thr Gln Val Tyr Tyr Ser Gly Glu Ile Ile Arg Ala
225 230 235 240

Ala Thr Thr Ser Pro Ala Arg Glu Asn Tyr Phe Met Arg Trp Leu Ser
245 250 255

Asp Leu Arg Glu Thr Cys Phe Ser Tyr Tyr Gln Lys Tyr Ile Glu Gly
260 265 270

Asn Lys Thr Phe Ala Ile Ile Ala Ile Val Phe Val Phe Ile Leu Thr
275 280 285

Ala Ile Leu Phe Leu Met Ser Arg Arg Tyr Ser Arg Glu Lys Gln Asn
290 295 300

<210> 18
<211> 304
<212> PRT
<213> Variola virus

<400> 18

Met Pro Gln Gln Leu Ser Pro Ile Asn Ile Glu Thr Lys Lys Ala Ile
1 5 10 15

Ser Asn Ala Arg Leu Lys Pro Leu Asn Ile His Tyr Asn Glu Ser Lys
20 25 30

Pro Thr Thr Ile Gln Asn Thr Gly Lys Leu Val Arg Ile Asn Phe Lys
35 40 45

Gly Gly Tyr Leu Ser Gly Gly Phe Leu Pro Asn Glu Tyr Val Leu Ser
50 55 60

Ser Leu His Ile Tyr Trp Gly Lys Glu Asp Asp Tyr Gly Ser Asn His
 65 70 75 80
 Leu Ile Asp Val Tyr Lys Tyr Ser Gly Glu Ile Asn Leu Val His Trp
 85 90 95
 Asn Lys Lys Lys Tyr Ser Ser Tyr Glu Glu Ala Lys Lys His Asp Asp
 100 105 110
 Gly Leu Ile Ile Ile Ser Ile Phe Leu Gln Val Ser Asp His Lys Asn
 115 120 125
 Val Tyr Phe Gln Lys Ile Val Asn Gln Leu Asp Ser Ile Arg Thr Ala
 130 135 140
 Asn Thr Ser Ala Pro Phe Asp Ser Val Phe Tyr Leu Asp Asn Leu Leu
 145 150 155 160
 Pro Ser Lys Leu Asp Tyr Phe Lys Tyr Leu Gly Thr Thr Ile Asn His
 165 170 175
 Ser Ala Asp Ala Val Trp Ile Ile Phe Pro Thr Pro Ile Asn Ile His
 180 185 190
 Ser Asp Gln Leu Ser Lys Phe Arg Thr Leu Leu Ser Leu Ser Asn His
 195 200 205
 Glu Gly Lys Pro His Tyr Ile Thr Glu Asn Tyr Arg Asn Pro Tyr Lys
 210 215 220
 Leu Asn Asp Asp Thr Glu Val Tyr Tyr Ser Gly Glu Ile Ile Arg Ala
 225 230 235 240
 Ala Thr Thr Ser Pro Ala Arg Glu Asn Tyr Phe Met Arg Trp Leu Ser
 245 250 255
 Asp Leu Arg Glu Thr Cys Phe Ser Tyr Tyr Gln Lys Tyr Ile Glu Gly
 260 265 270
 Asn Lys Thr Phe Ala Ile Ile Ala Ile Val Phe Val Tyr Ile Leu Thr
 275 280 285
 Ala Ile Leu Phe Leu Met Ser Arg Arg Tyr Ser Arg Glu Lys Gln Asn
 290 295 300

<210> 19
 <211> 304
 <212> PRT
 <213> Variola virus

<400> 19

Met Pro Gln Gln Leu Ser Pro Ile Asn Ile Glu Thr Lys Lys Ala Ile
1 5 10 15

Ser Asn Ala Arg Leu Lys Pro Leu Asn Ile His Tyr Asn Glu Ser Lys
20 25 30

Pro Thr Thr Ile Gln Asn Thr Gly Lys Leu Val Arg Ile Asn Phe Lys
35 40 45

Gly Gly Tyr Leu Ser Gly Gly Phe Leu Pro Asn Glu Tyr Val Leu Ser
50 55 60

Ser Leu His Ile Tyr Trp Gly Lys Glu Asp Asp Tyr Gly Ser Asn His
65 70 75 80

Leu Ile Asp Val Tyr Lys Tyr Ser Gly Glu Ile Asn Leu Val His Trp
85 90 95

Asn Lys Lys Lys Tyr Ser Ser Tyr Glu Glu Ala Lys Lys His Asp Asp
100 105 110

Gly Leu Ile Ile Ile Ser Ile Phe Leu Gln Val Ser Asp His Lys Asn
115 120 125

Val Tyr Phe Gln Lys Ile Val Asn Gln Leu Asp Ser Ile Arg Thr Ala
130 135 140

Asn Thr Ser Ala Pro Phe Asp Ser Val Phe Tyr Leu Asp Asn Leu Leu
145 150 155 160

Pro Ser Lys Leu Asp Tyr Phe Lys Tyr Leu Gly Thr Thr Ile Asn His
165 170 175

Ser Ala Asp Ala Val Trp Ile Ile Phe Pro Thr Pro Ile Asn Ile His
180 185 190

Ser Asp Gln Leu Ser Lys Phe Arg Thr Leu Leu Ser Leu Ser Asn His
195 200 205

Glu Gly Lys Pro His Tyr Ile Thr Glu Asn Tyr Arg Asn Pro Tyr Lys
210 215 220

Leu Asn Asp Asp Thr Glu Val Tyr Tyr Ser Gly Glu Ile Ile Arg Ala
225 230 235 240

Ala Thr Thr Ser Pro Ala Arg Glu Asn Tyr Phe Met Arg Trp Leu Ser
Page 18

245' 250 255

Asp Leu Arg Glu Thr Cys Phe Ser Tyr Tyr Gln Lys Tyr Ile Glu Gly
260 265 270

Asn Lys Thr Phe Ala Ile Ile Ala Ile Val Phe Val Tyr Ile Leu Thr
275 280 285

Ala Ile Leu Phe Leu Met Ser Arg Arg Tyr Ser Arg Glu Lys Gln Asn
290 295 300

<210> 20
<211> 304
<212> PRT
<213> Artificial

<220>
<223> Consensus sequence for SEQ ID NOS. 16-19.

<400> 20

Met Pro Gln Gln Leu Ser Pro Ile Asn Ile Glu Thr Lys Lys Ala Ile
1 5 10 15

Ser Asn Ala Arg Leu Lys Pro Leu Asn Ile His Tyr Asn Glu Ser Lys
20 25 30

Pro Thr Thr Ile Gln Asn Thr Gly Lys Leu Val Arg Ile Asn Phe Lys
35 40 45

Gly Gly Tyr Ile Ser Gly Gly Phe Leu Pro Asn Glu Tyr Val Leu Ser
50 55 60

Ser Leu His Ile Tyr Trp Gly Lys Glu Asp Asp Tyr Gly Ser Asn His
65 70 75 80

Leu Ile Asp Val Tyr Lys Tyr Ser Gly Glu Ile Asn Leu Val His Trp
85 90 95

Asn Lys Lys Lys Tyr Ser Ser Tyr Glu Glu Ala Lys Lys His Asp Asp
100 105 110

Gly Leu Ile Ile Ile Ser Ile Phe Leu Gln Val Ser Asp His Lys Asn
115 120 125

Val Tyr Phe Gln Lys Ile Val Asn Gln Leu Asp Ser Ile Arg Ser Ala
130 135 140

Asn Thr Ser Ala Pro Phe Asp Ser Val Phe Tyr Leu Asp Asn Leu Leu
145 150 155 160

Pro Ser Lys Leu Asp Tyr Phe Thr Tyr Leu Gly Thr Thr Ile Asn His
165 170 175

Ser Ala Asp Ala Val Trp Ile Ile Phe Pro Thr Pro Ile Asn Ile His
180 185 190

Ser Asp Gln Leu Ser Lys Phe Arg Thr Leu Leu Ser Ser Ser Asn His
195 200 205

Asp Gly Lys Pro His Tyr Ile Thr Glu Asn Tyr Arg Asn Pro Tyr Lys
210 215 220

Leu Asn Asp Asp Thr Gln Val Tyr Tyr Ser Gly Glu Ile Ile Arg Ala
225 230 235 240

Ala Thr Thr Ser Pro Ala Arg Glu Asn Tyr Phe Met Arg Trp Leu Ser
245 250 255

Asp Leu Arg Glu Thr Cys Phe Ser Tyr Tyr Gln Lys Tyr Ile Glu Gly
260 265 270

Asn Lys Thr Phe Ala Ile Ile Ala Ile Val Phe Val Phe Ile Leu Thr
275 280 285

Ala Ile Leu Phe Leu Met Ser Arg Arg Tyr Ser Arg Glu Lys Gln Asn
290 295 300

<210> 21
<211> 317
<212> PRT
<213> Vaccinia virus

<400> 21

Met Lys Thr Ile Ser Val Val Thr Leu Leu Cys Val Leu Pro Ala Val
1 5 10 15

Val Tyr Ser Thr Cys Thr Val Pro Thr Met Asn Asn Ala Lys Leu Thr
20 25 30

Ser Thr Glu Thr Ser Phe Asn Asp Lys Gln Lys Val Thr Phe Thr Cys
35 40 45

Asp Gln Gly Tyr His Ser Ser Asp Pro Asn Ala Val Cys Glu Thr Asp
50 55 60

Lys Trp Lys Tyr Glu Asn Pro Cys Lys Lys Met Cys Thr Val Ser Asp
65 70 75 80

Tyr Ile Ser Glu Leu Tyr Asn Lys Pro Leu Tyr Glu Val Asn Ser Thr
 85 90 95
 Met Thr Leu Ser Cys Asn Gly Glu Thr Lys Tyr Phe Arg Cys Glu Glu
 100 105 110
 Lys Asn Gly Asn Thr Ser Trp Asn Asp Thr Val Thr Cys Pro Asn Ala
 115 120 125
 Glu Cys Gln Pro Leu Gln Leu Glu His Gly Ser Cys Gln Pro Val Lys
 130 135 140
 Glu Lys Tyr Ser Phe Gly Glu Tyr Met Thr Ile Asn Cys Asp Val Gly
 145 150 155 160
 Tyr Glu Val Ile Gly Ala Ser Tyr Ile Ser Cys Thr Ala Asn Ser Trp
 165 170 175
 Asn Val Ile Pro Ser Cys Gln Gln Lys Cys Asp Met Pro Ser Leu Ser
 180 185 190
 Asn Gly Leu Ile Ser Gly Ser Thr Phe Ser Ile Gly Gly Val Ile His
 195 200 205
 Leu Ser Cys Lys Ser Gly Phe Thr Leu Thr Gly Ser Pro Ser Ser Thr
 210 215 220
 Cys Ile Asp Gly Lys Trp Asn Pro Val Leu Pro Ile Cys Val Arg Thr
 225 230 235 240
 Asn Glu Glu Phe Asp Pro Val Asp Asp Gly Pro Asp Asp Glu Thr Asp
 245 250 255
 Leu Ser Lys Leu Ser Lys Asp Val Val Gln Tyr Glu Gln Glu Ile Glu
 260 265 270
 Ser Leu Glu Ala Thr Tyr His Ile Ile Ile Val Ala Leu Thr Ile Met
 275 280 285
 Gly Val Ile Phe Leu Ile Ser Val Ile Val Leu Val Cys Ser Cys Asp
 290 295 300
 Lys Asn Asn Asp Gln Tyr Lys Phe His Lys Leu Leu Pro
 305 310 315

<210> 22
 <211> 317
 <212> PRT
 <213> Vaccinia virus

<400> 22

Met Lys Thr Ile Ser Val Val Thr Leu Leu Cys Val Leu Pro Ala Val
1 5 10 15

Val Tyr Ser Thr Cys Thr Val Pro Thr Met Asn Asn Ala Lys Leu Thr
20 25 30

Ser Thr Glu Thr Ser Phe Asn Asn Asn Gln Lys Val Thr Phe Thr Cys
35 40 45

Asp Gln Gly Tyr His Ser Ser Asp Pro Asn Ala Val Cys Glu Thr Asp
50 55 60

Lys Trp Lys Tyr Glu Asn Pro Cys Lys Lys Met Cys Thr Val Ser Asp
65 70 75 80

Tyr Ile Ser Glu Leu Tyr Asn Lys Pro Leu Tyr Glu Val Asn Ser Thr
85 90 95

Met Thr Leu Ser Cys Asn Gly Glu Thr Lys Tyr Phe Arg Cys Glu Glu
100 105 110

Lys Asn Gly Asn Thr Ser Trp Asn Asp Thr Val Thr Cys Pro Asn Ala
115 120 125

Glu Cys Gln Pro Leu Gln Leu Glu His Gly Ser Cys Gln Pro Val Lys
130 135 140

Glu Lys Tyr Ser Phe Gly Glu Tyr Met Thr Ile Asn Cys Asp Val Gly
145 150 155 160

Tyr Glu Val Ile Gly Ala Ser Tyr Ile Ser Cys Thr Ala Asn Ser Trp
165 170 175

Asn Val Ile Pro Ser Cys Gln Gln Lys Cys Asp Ile Pro Ser Leu Ser
180 185 190

Asn Gly Leu Ile Ser Gly Ser Thr Phe Ser Ile Gly Gly Val Ile His
195 200 205

Leu Ser Cys Lys Ser Gly Phe Ile Leu Thr Gly Ser Pro Ser Ser Thr
210 215 220

Cys Ile Asp Gly Lys Trp Asn Pro Val Leu Pro Ile Cys Val Arg Thr
225 230 235 240

Asn Glu Glu Phe Asp Pro Val Asp Asp Gly Pro Asp Asp Glu Thr Asp
Page 22

245

250

255

Leu Ser Lys Leu Ser Lys Asp Val Val Gln Tyr Glu Gln Glu Ile Glu
260 265 270

Ser Leu Glu Ala Thr Tyr His Ile Ile Ile Val Ala Leu Thr Ile Met
275 280 285

Gly Val Ile Phe Leu Ile Ser Val Ile Val Leu Val Cys Ser Cys Asp
290 295 300

Lys Asn Asn Asp Gln Tyr Lys Phe His Lys Leu Leu Pro
305 310 315

<210> 23
<211> 317
<212> PRT
<213> Variola virus

<400> 23

Met Lys Thr Ile Ser Val Val Thr Leu Leu Cys Val Leu Pro Ala Val
1 5 10 15

Val Tyr Ser Thr Cys Thr Val Pro Thr Met Asn Asn Ala Lys Leu Thr
20 25 30

Ser Thr Glu Thr Ser Phe Asn Asp Lys Gln Lys Val Thr Phe Thr Cys
35 40 45

Asp Ser Gly Tyr Tyr Ser Leu Asp Pro Asn Ala Val Cys Glu Thr Asp
50 55 60

Lys Trp Lys Tyr Glu Asn Pro Cys Lys Lys Met Cys Thr Val Ser Asp
65 70 75 80

Tyr Val Ser Glu Leu Tyr Asn Lys Pro Leu Tyr Glu Val Asn Ala Ile
85 90 95

Ile Thr Leu Ile Cys Lys Asp Glu Thr Lys Tyr Phe Arg Cys Glu Glu
100 105 110

Lys Asn Gly Asn Thr Ser Trp Asn Asp Thr Val Thr Cys Pro Asn Ala
115 120 125

Glu Cys Gln Ser Leu Gln Leu Asp His Gly Ser Cys Gln Pro Val Lys
130 135 140

Glu Lys Tyr Ser Phe Gly Glu His Ile Thr Ile Asn Cys Asp Val Gly
145 150 155 160

Tyr Glu Val Ile Gly Ala Ser Tyr Ile Thr Cys Thr Ala Asn Ser Trp
165 170 175

Asn Val Ile Pro Ser Cys Gln Gln Lys Cys Asp Ile Pro Ser Leu Ser
180 185 190

Asn Gly Leu Ile Ser Gly Ser Thr Phe Ser Ile Gly Gly Val Ile His
195 200 205

Leu Ser Cys Lys Ser Gly Phe Ile Leu Thr Gly Ser Pro Ser Ser Thr
210 215 220

Cys Ile Asp Gly Lys Trp Asn Pro Val Leu Pro Ile Cys Ile Arg Ser
225 230 235 240

Asn Glu Glu Phe Asp Pro Val Glu Asp Gly Pro Asp Asp Glu Thr Asp
245 250 255

Leu Ser Lys Leu Ser Lys Asp Val Val Gln Tyr Glu Gln Glu Ile Glu
260 265 270

Ser Leu Glu Ala Thr Tyr His Ile Ile Ile Val Ala Leu Thr Ile Met
275 280 285

Gly Val Ile Phe Leu Ile Ser Val Ile Val Leu Val Cys Ser Cys Asn
290 295 300

Lys Asn Asn Asp Gln Tyr Lys Phe His Lys Leu Leu Leu
305 310 315

<210> 24
<211> 317
<212> PRT
<213> Variola virus

<400> 24

Met Lys Thr Ile Ser Val Val Thr Leu Leu Cys Val Leu Pro Ala Val
1 5 10 15

Val Tyr Ser Thr Cys Thr Val Pro Thr Met Asn Asn Ala Lys Leu Thr
20 25 30

Ser Thr Glu Thr Ser Phe Asn Asp Lys Gln Lys Val Thr Phe Thr Cys
35 40 45

Asp Ser Gly Tyr Tyr Ser Leu Asp Pro Asn Ala Val Cys Glu Thr Asp
50 55 60

Lys Trp Lys Tyr Glu Asn Pro Cys Lys Lys Met Cys Thr Val Ser Asp
 65 70 75 80
 Tyr Val Ser Glu Leu Tyr Asn Lys Pro Leu Tyr Glu Val Asn Ala Ile
 85 90 95
 Ile Thr Leu Ile Cys Lys Asp Glu Thr Lys Tyr Phe Arg Cys Glu Glu
 100 105 110
 Lys Asn Gly Asn Thr Ser Trp Asn Asp Thr Val Thr Cys Pro Asn Ala
 115 120 125
 Glu Cys Gln Ser Leu Gln Leu Asp His Gly Ser Cys Gln Pro Val Lys
 130 135 140
 Glu Lys Tyr Ser Phe Gly Glu His Ile Thr Ile Asn Cys Asp Val Gly
 145 150 155 160
 Tyr Glu Val Ile Gly Ala Ser Tyr Ile Thr Cys Thr Ala Asn Ser Trp
 165 170 175
 Asn Val Ile Pro Ser Cys Gln Gln Lys Cys Asp Ile Pro Ser Leu Ser
 180 185 190
 Asn Gly Leu Ile Ser Gly Ser Thr Phe Ser Ile Gly Gly Val Ile His
 195 200 205
 Leu Ser Cys Lys Ser Gly Phe Ile Leu Thr Gly Ser Pro Ser Ser Thr
 210 215 220
 Cys Ile Asp Gly Lys Trp Asn Pro Val Leu Pro Ile Cys Ile Arg Ser
 225 230 235 240
 Asn Glu Glu Phe Asp Pro Val Glu Asp Gly Pro Asp Asp Glu Thr Asp
 245 250 255
 Leu Ser Lys Leu Ser Lys Asp Val Val Gln Tyr Glu Gln Glu Ile Glu
 260 265 270
 Ser Leu Glu Ala Thr Tyr His Ile Ile Ile Val Ala Leu Thr Ile Met
 275 280 285
 Gly Val Ile Phe Leu Ile Ser Val Ile Val Leu Val Cys Ser Cys Asn
 290 295 300
 Lys Asn Asn Asp Gln Tyr Lys Phe His Lys Leu Leu Leu
 305 310 315

<210> 25
 <211> 317
 <212> PRT
 <213> Variola virus

<400> 25

Met Lys Thr Ile Ser Val Val Thr Leu Leu Cys Val Leu Pro Ala Val
 1 5 10 15

Val Tyr Ser Thr Cys Thr Val Pro Thr Met Asn Asn Ala Lys Leu Thr
 20 25 30

Ser Thr Glu Thr Ser Phe Asn Asp Lys Gln Lys Val Thr Phe Thr Cys
 35 40 45

Asp Ser Gly Tyr Tyr Ser Leu Asp Pro Asn Ala Val Cys Glu Thr Asp
 50 55 60

Lys Trp Lys Tyr Glu Asn Pro Cys Lys Lys Met Cys Thr Val Ser Asp
 65 70 75 80

Tyr Val Ser Glu Leu Tyr Asn Lys Pro Leu Tyr Glu Val Asn Ala Ile
 85 90 95

Ile Thr Leu Ile Cys Lys Asp Glu Thr Lys Tyr Phe Arg Cys Glu Glu
 100 105 110

Lys Asn Gly Asn Thr Ser Trp Asn Asp Thr Val Thr Cys Pro Asn Ala
 115 120 125

Glu Cys Gln Ser Leu Gln Leu Asp His Gly Ser Cys Gln Pro Val Lys
 130 135 140

Glu Lys Tyr Ser Phe Gly Glu His Ile Thr Ile Asn Cys Asp Val Gly
 145 150 155 160

Tyr Glu Val Ile Gly Ala Ser Tyr Ile Thr Cys Thr Ala Asn Ser Trp
 165 170 175

Asn Val Ile Pro Ser Cys Gln Gln Lys Cys Asp Ile Pro Ser Leu Ser
 180 185 190

Asn Gly Leu Ile Ser Gly Ser Thr Phe Ser Ile Gly Gly Val Ile His
 195 200 205

Leu Ser Cys Lys Ser Gly Phe Ile Leu Thr Gly Ser Pro Ser Ser Thr
 210 215 220

Cys Ile Asp Gly Lys Trp Asn Pro Val Leu Pro Ile Cys Ile Arg Ser
225 230 235 240

Asn Glu Glu Phe Asp Pro Val Glu Asp Gly Pro Asp Asp Glu Thr Asp
245 250 255

Leu Ser Lys Leu Ser Lys Asp Val Val Gln Tyr Glu Gln Glu Ile Glu
260 265 270

Ser Leu Glu Ala Thr Tyr His Ile Ile Ile Val Ala Leu Thr Ile Met
275 280 285

Gly Val Ile Phe Leu Ile Ser Val Ile Val Leu Val Cys Ser Cys Asn
290 295 300

Lys Asn Asn Asp Gln Tyr Lys Phe His Lys Leu Leu Leu
305 310 315

<210> 26
<211> 317
<212> PRT
<213> Variola virus

<400> 26

Met Lys Thr Ile Ser Val Val Thr Leu Leu Cys Val Leu Pro Ala Val
1 5 10 15

Val Tyr Ser Thr Cys Thr Val Pro Thr Met Asn Asn Ala Lys Leu Thr
20 25 30

Ser Thr Glu Thr Ser Phe Asn Asp Lys Gln Lys Val Thr Phe Thr Cys
35 40 45

Asp Ser Gly Tyr Tyr Ser Leu Asp Pro Asn Ala Val Cys Glu Thr Asp
50 55 60

Lys Trp Lys Tyr Glu Asn Pro Cys Lys Lys Met Cys Thr Val Ser Asp
65 70 75 80

Tyr Val Ser Glu Leu Tyr Asn Lys Pro Leu Tyr Glu Val Asn Ala Ile
85 90 95

Ile Thr Leu Ile Cys Lys Asp Glu Thr Lys Tyr Phe Arg Cys Glu Glu
100 105 110

Lys Asn Gly Asn Thr Ser Trp Asn Asp Thr Val Thr Cys Pro Asn Ala
115 120 125

Glu Cys Gln Ser Leu Gln Leu Asp His Gly Ser Cys Gln Pro Val Lys
Page 27

130

135

140

Glu Lys Tyr Ser Phe Gly Glu His Ile Thr Ile Asn Cys Asp Val Gly
 145 150 155 160

Tyr Glu Val Ile Gly Ala Ser Tyr Ile Thr Cys Thr Ala Asn Ser Trp
 165 170 175

Asn Val Ile Pro Ser Cys Gln Gln Lys Cys Asp Ile Pro Ser Leu Ser
 180 185 190

Asn Gly Leu Ile Ser Gly Ser Thr Phe Ser Ile Gly Gly Val Ile His
 195 200 205

Leu Ser Cys Lys Ser Gly Phe Ile Leu Thr Gly Ser Pro Ser Ser Thr
 210 215 220

Cys Ile Asp Gly Lys Trp Asn Pro Val Leu Pro Ile Cys Ile Arg Ser
 225 230 235 240

Asn Glu Glu Phe Asp Pro Val Glu Asp Gly Pro Asp Asp Glu Thr Asp
 245 250 255

Leu Ser Lys Leu Ser Lys Asp Val Val Gln Tyr Glu Gln Glu Ile Glu
 260 265 270

Ser Leu Glu Ala Thr Tyr His Ile Ile Ile Val Ala Leu Thr Ile Met
 275 280 285

Gly Val Ile Phe Leu Ile Ser Val Ile Val Leu Val Cys Ser Cys Asn
 290 295 300

Lys Asn Asn Asp Gln Tyr Lys Phe His Lys Leu Leu Leu
 305 310 315

<210> 27
 <211> 317
 <212> PRT
 <213> Artificial

<220>
 <223> Consensus sequence for SEQ ID NOS. 21-26.

<400> 27

Met Lys Thr Ile Ser Val Val Thr Leu Leu Cys Val Leu Pro Ala Val
 1 5 10 15

Val Tyr Ser Thr Cys Thr Val Pro Thr Met Asn Asn Ala Lys Leu Thr
 20 25 30

Ser Thr Glu Thr Ser Phe Asn Asp Lys Gln Lys Val Thr Phe Thr Cys
 35 40 45
 Asp Ser Gly Tyr Tyr Ser Leu Asp Pro Asn Ala Val Cys Glu Thr Asp
 50 55 60
 Lys Trp Lys Tyr Glu Asn Pro Cys Lys Lys Met Cys Thr Val Ser Asp
 65 70 75 80
 Tyr Val Ser Glu Leu Tyr Asn Lys Pro Leu Tyr Glu Val Asn Ala Ile
 85 90 95
 Ile Thr Leu Ile Cys Lys Asp Glu Thr Lys Tyr Phe Arg Cys Glu Glu
 100 105 110
 Lys Asn Gly Asn Thr Ser Trp Asn Asp Thr Val Thr Cys Pro Asn Ala
 115 120 125
 Glu Cys Gln Ser Leu Gln Leu Asp His Gly Ser Cys Gln Pro Val Lys
 130 135 140
 Glu Lys Tyr Ser Phe Gly Glu His Ile Thr Ile Asn Cys Asp Val Gly
 145 150 155 160
 Tyr Glu Val Ile Gly Ala Ser Tyr Ile Thr Cys Thr Ala Asn Ser Trp
 165 170 175
 Asn Val Ile Pro Ser Cys Gln Gln Lys Cys Asp Ile Pro Ser Leu Ser
 180 185 190
 Asn Gly Leu Ile Ser Gly Ser Thr Phe Ser Ile Gly Gly Val Ile His
 195 200 205
 Leu Ser Cys Lys Ser Gly Phe Ile Leu Thr Gly Ser Pro Ser Ser Thr
 210 215 220
 Cys Ile Asp Gly Lys Trp Asn Pro Val Leu Pro Ile Cys Ile Arg Ser
 225 230 235 240
 Asn Glu Glu Phe Asp Pro Val Glu Asp Gly Pro Asp Asp Glu Thr Asp
 245 250 255
 Leu Ser Lys Leu Ser Lys Asp Val Val Gln Tyr Glu Gln Glu Ile Glu
 260 265 270
 Ser Leu Glu Ala Thr Tyr His Ile Ile Ile Val Ala Leu Thr Ile Met
 275 280 285

Gly Val Ile Phe Leu Ile Ser Val Ile Val Leu Val Cys Ser Cys Asn
 290 295 300

Lys Asn Asn Asp Gln Tyr Lys Phe His Lys Leu Leu Leu
 305 310 315

<210> 28
 <211> 203
 <212> PRT
 <213> Vaccinia virus

<400> 28

Met Ala Trp Ser Ile Thr Asn Lys Ala Asp Thr Ser Ser Phe Thr Lys
 1 5 10 15

Met Ala Glu Ile Arg Ala His Leu Lys Asn Ser Ala Glu Asn Lys Asp
 20 25 30

Lys Asn Glu Asp Ile Phe Pro Glu Asp Val Ile Ile Pro Ser Thr Lys
 35 40 45

Pro Lys Thr Lys Arg Ala Thr Thr Pro Arg Lys Pro Ala Ala Thr Lys
 50 55 60

Arg Ser Thr Lys Lys Glu Glu Val Glu Glu Glu Val Val Ile Glu Glu
 65 70 75 80

Tyr His Gln Thr Thr Glu Lys Asn Ser Pro Ser Pro Gly Val Ser Asp
 85 90 95

Ile Val Glu Ser Val Ala Ala Val Glu Leu Asp Asp Ser Asp Gly Asp
 100 105 110

Asp Glu Pro Met Val Gln Val Glu Ala Gly Lys Val Asn His Ser Ala
 115 120 125

Arg Ser Asp Leu Ser Asp Leu Lys Val Ala Thr Asp Asn Ile Val Lys
 130 135 140

Ser Leu Lys Lys Ile Ile Thr Arg Ile Ser Ala Val Ser Thr Val Leu
 145 150 155 160

Glu Asp Val Gln Ala Ala Gly Ile Ser Arg Gln Phe Thr Ser Met Thr
 165 170 175

Lys Ala Ile Thr Thr Leu Ser Asp Leu Val Thr Glu Gly Lys Ser Lys
 180 185 190

Val Val Arg Lys Lys Val Lys Thr Cys Lys Lys
195 200

<210> 29
<211> 203
<212> PRT
<213> Vaccinia virus

<400> 29

Met Ala Trp Ser Ile Thr Asn Lys Ala Asp Thr Ser Ser Phe Thr Lys
1 5 10 15

Met Ala Glu Ile Arg Ala His Leu Lys Asn Ser Ala Glu Asn Lys Asp
20 25 30

Lys Asn Glu Asp Ile Phe Pro Glu Asp Val Ile Ile Pro Ser Thr Lys
35 40 45

Pro Lys Thr Lys Arg Ala Thr Thr Pro Arg Lys Pro Ala Ala Thr Lys
50 55 60

Arg Ser Thr Lys Lys Glu Glu Val Glu Glu Glu Val Val Ile Glu Glu
65 70 75 80

Tyr His Gln Thr Thr Glu Lys Asn Ser Pro Ser Pro Gly Val Gly Asp
85 90 95

Ile Val Glu Ser Val Ala Ala Val Glu Leu Asp Asp Ser Asp Gly Asp
100 105 110

Asp Glu Pro Met Val Gln Val Glu Ala Gly Lys Val Asn His Ser Ala
115 120 125

Arg Ser Asp Leu Ser Asp Leu Lys Val Ala Thr Asp Asn Ile Val Lys
130 135 140

Ser Leu Lys Lys Ile Ile Thr Arg Ile Ser Ala Val Ser Thr Val Leu
145 150 155 160

Glu Asp Val Gln Ala Ala Gly Ile Ser Arg Gln Phe Thr Ser Met Thr
165 170 175

Lys Ala Ile Thr Thr Leu Ser Asp Leu Val Thr Glu Gly Lys Ser Lys
180 185 190

Val Val Arg Lys Lys Val Lys Thr Cys Lys Lys
195 200

<210> 30

<211> 221
<212> PRT
<213> Variola virus

<400> 30

Met Ala Trp Ser Ile Thr Asn Lys Ala Asp Thr Ser Ser Phe Thr Lys
1 5 10 15

Met Ala Glu Ile Arg Ala His Leu Arg Asn Ser Ala Glu Asn Lys Asp
20 25 30

Lys Asn Asp Asp Ile Phe Pro Glu Asp Val Ile Ile Pro Ser Thr Lys
35 40 45

Pro Lys Thr Lys Arg Ala Thr Thr Pro Arg Lys Pro Ala Ala Thr Lys
50 55 60

Arg Ser Thr Lys Lys Asp Lys Glu Lys Glu Glu Val Glu Glu Glu Glu
65 70 75 80

Val Val Ile Glu Glu Tyr His Gln Thr Thr Glu Glu Asn Ser Pro Pro
85 90 95

Pro Ser Ser Ser Pro Gly Val Gly Asn Ile Val Glu Ser Val Thr Ala
100 105 110

Val Glu Leu Asp Asp Ser Asn Gly Asp Asp Asp Asn Asp Asn Asp Asn
115 120 125

Asp Asp Asn Glu Pro Met Val Gln Val Glu Ala Gly Lys Val Asn His
130 135 140

Ser Ala Arg Ser Asp Leu Ser Asp Leu Lys Val Ala Thr Asp Asn Ile
145 150 155 160

Val Lys Ser Leu Lys Lys Ile Ile Thr Arg Ile Ser Ala Val Ser Thr
165 170 175

Val Leu Glu Asp Val Gln Ala Ala Gly Ile Ser Arg Gln Phe Thr Ser
180 185 190

Met Thr Lys Ser Ile Thr Thr Leu Ser Asp Leu Val Thr Glu Gly Lys
195 200 205

Ser Lys Val Val Arg Lys Lys Val Lys Thr Cys Lys Lys
210 215 220

<210> 31
<211> 220

<212> PRT
<213> Variola virus

<400> 31

Met Ala Trp Ser Ile Thr Asn Lys Ala Asp Thr Ser Ser Phe Thr Lys
1 5 10 15

Met Ala Glu Ile Arg Ala His Leu Arg Asn Ser Ala Glu Asn Lys Asp
20 25 30

Lys Asn Asp Asp Ile Phe Pro Glu Asp Val Ile Ile Pro Ser Thr Lys
35 40 45

Pro Lys Thr Lys Arg Ala Thr Thr Pro Arg Lys Pro Ala Ala Thr Lys
50 55 60

Arg Ser Thr Lys Lys Asp Lys Glu Lys Glu Glu Val Glu Glu Glu Val
65 70 75 80

Val Ile Glu Glu Tyr His Gln Thr Thr Glu Glu Asn Ser Pro Pro Pro
85 90 95

Ser Ser Ser Pro Gly Val Gly Asp Ile Val Glu Ser Val Thr Ala Val
100 105 110

Glu Leu Asp Asp Ser Asn Gly Asp Asp Asp Asn Asp Asn Asp Asn Asp
115 120 125

Asp Asn Glu Pro Met Val Gln Val Glu Ala Gly Lys Val Asn His Ser
130 135 140

Ala Arg Ser Asp Leu Ser Asp Leu Lys Val Ala Thr Asp Asn Ile Val
145 150 155 160

Lys Ser Leu Lys Lys Ile Ile Thr Arg Ile Ser Ala Val Ser Thr Val
165 170 175

Leu Glu Asp Val Gln Ala Ala Gly Ile Ser Arg Gln Phe Thr Ser Met
180 185 190

Thr Lys Ser Ile Thr Thr Leu Ser Asp Leu Val Thr Glu Gly Lys Ser
195 200 205

Lys Val Val Arg Lys Lys Val Lys Thr Cys Lys Lys
210 215 220

<210> 32
<211> 221
<212> PRT

<213> Artificial

<220>

<223> Consensus sequence for SEQ ID NOS. 28-31.

<400> 32

Met Ala Trp Ser Ile Thr Asn Lys Ala Asp Thr Ser Ser Phe Thr Lys
1 5 10 15

Met Ala Glu Ile Arg Ala His Leu Lys Asn Ser Ala Glu Asn Lys Asp
20 25 30

Lys Asn Asp Asp Ile Phe Pro Glu Asp Val Ile Ile Pro Ser Thr Lys
35 40 45

Pro Lys Thr Lys Arg Ala Thr Thr Pro Arg Lys Pro Ala Ala Thr Lys
50 55 60

Arg Ser Thr Lys Lys Asp Lys Glu Lys Glu Glu Val Val Glu Glu Glu
65 70 75 80

Val Val Ile Glu Glu Tyr His Gln Thr Thr Glu Lys Asn Ser Pro Pro
85 90 95

Pro Ser Ser Ser Pro Gly Val Gly Asp Ile Val Glu Ser Val Thr Ala
100 105 110

Val Glu Leu Asp Asp Ser Asn Gly Asp Asp Asp Asn Asp Asn Asp Asn
115 120 125

Asp Asp Asn Glu Pro Met Val Gln Val Glu Ala Gly Lys Val Asn His
130 135 140

Ser Ala Arg Ser Asp Leu Ser Asp Leu Lys Val Ala Thr Asp Asn Ile
145 150 155 160

Val Lys Ser Leu Lys Lys Ile Ile Thr Arg Ile Ser Ala Val Ser Thr
165 170 175

Val Leu Glu Asp Val Gln Ala Ala Gly Ile Ser Arg Gln Phe Thr Ser
180 185 190

Met Thr Lys Ala Ile Thr Thr Leu Ser Asp Leu Val Thr Glu Gly Lys
195 200 205

Ser Lys Val Val Arg Lys Lys Val Lys Thr Cys Lys Lys
210 215 220